What is claimed is:

1. A near-field optical probe, comprising:

a cantilever;

a base for supporting said cantilever;

a tip in the form of a conical or pyramidal formed on said cantilever in a surface opposite to a surface of said base;

a microscopic aperture formed in an end of said tip;

a shade film formed on the surface of said cantilever opposite to the surface of said base and on a surface of said tip excepting said microscopic aperture;

wherein said tip and said cantilever are formed using a transparent material high in transmissivity for a wavelength of light to be generated or detected in said microscopic aperture, said tip being filled with the transparent material.

2. A near-field optical probe according to claim 1, wherein the transparent material forming said tip and the transparent material forming said cantilever are formed of a same transparent material.

3. A near-field optical probe according to claim 2, wherein the transparent material is silicon dioxide.

4. A near-field optical probe according to claim 1, wherein the transparent material forming said tip and the transparent material forming said cantilever are different in optical characteristic.

5. A near-field optical probe according to claim 1, wherein said tip is in a circular conical form.

6. A near-field optical probe according to claim 1, wherein said tip comprises a plurality of cones or pyramids different in angle of a side surface of the cone or pyramid.

7. A near-field optical probe according to claim 1, wherein said cantilever has a lens to focus incident light to said microscopic aperture or collimate light detected at said microscopic aperture.

8. A near-field optical probe according to claim 7, wherein said lens is a Fresnel lens formed on a side of said base of said cantilever.

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9. A near-field optical probe according to claim 7, wherein said lens is a refractive-index distribution type lens formed by controlling a refractive-index distribution in said cantilever.

10. A near-field optical probe according to claim 1, wherein an end of said tip is positioned nearly in a same plane as an end surface of said shade film.

11. A near-field optical probe according to claim 1, wherein an end of said tip protrudes greater than the end face of said shade film, an amount of protrusion thereof being equal to or smaller than a half of a wavelength of incident light on said microscopic aperture and/or light to be detected at said microscopic aperture.

12. A near-field optical probe, comprising:

a cantilever;

a base for supporting said cantilever;

a tip in the form of a conical or pyramidal formed on said cantilever in a surface opposite to a surface of said base;

a microscopic aperture formed in an end of said tip;

a shade film formed on the surface of said cantilever opposite to the surface of said base and on a surface of said tip excepting said microscopic aperture;

wherein, provided that a height of said tip is H, an inclination angle of said cantilever is θ1, a spot diameter on said cantilever of incident light onto said tip or a spot diameter on said cantilever of light detected by said microscopic aperture and being incident on a detector is R1, and a distance from a center of said tip to a free end of said cantilever is L1, L1 is given satisfying

$$R1 < L1 < H / \tan \theta 1.$$

13. A near-field optical probe according to claim 12, wherein a tip of said cantilever has a slant portion in such a form as spreading from the tip side to the base side.

14. A near-field optical probe according to claim 12, wherein a side surface of said cantilever has a slant portion in such a form as spreading from the tip side to the base side.

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15. A near-field optical probe according to claim 12, wherein, at a tip of said cantilever, a thin-sheet-formed connecting portion is formed in a manner protruding toward said base, a thin-sheet-formed penthouse portion being formed extending parallel with said cantilever from said connecting portion.

16. A near-field optical probe according to claim 12, having on said cantilever a convex portion separate from said tip in position closer to the free end than a fixed end of said cantilever.

17. A near-field optical probe according to claim 16, wherein said convex portion is formed on said cantilever on a side forming said tip in position closer to the fixed end than said tip, a height of said convex portion being less than a height of said tip.

18. A near-field optical probe according to claim 16, wherein said convex portion is formed on said cantilever on a side opposite to the side forming said tip.

19. A near-field optical apparatus using a near-field optical probe as claimed in claim 1, the near-field optical apparatus having

an introducing/detecting optical system for introducing light to said microscopic aperture or detecting light from said microscopic aperture,

detector detecting a distance between said microscopic aperture and said sample, and

a fine movement mechanism for finely moving said sample or said near-field optical probe,

wherein said detector uses an optical lever method,

a lens of said introducing/detecting optical system and a mirror of said detector being integrated together.

20. A near-field optical apparatus using a near-field optical probe as claimed in claim 1, the near-field optical apparatus having

an introducing/detecting optical system for introducing light to said microscopic aperture or detecting light from said microscopic aperture,

detector detecting a distance between said microscopic aperture and said sample, and

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a fine movement mechanism for finely moving said sample or said near-field optical probe,

wherein said detector has a light source and an optical-detector in a plane nearly vertical to said cantilever.

21. A near-field optical apparatus according to claim 20, wherein said optical-detector detects reflection light upon said cantilever of light emitted from said light source.

22. A near-field optical apparatus according to claim 20, wherein said optical-detector detects diffraction light upon said cantilever of light emitted from said light source.

23. A near-field optical apparatus using a near-field optical probe as claimed in claim 1, the near-field optical apparatus having

an introducing/detecting optical system for introducing light to said microscopic aperture or detecting light from said microscopic aperture,

detector detecting a distance between said microscopic aperture and said sample, and

a fine movement mechanism for finely moving said sample or said near-field optical probe,

wherein said detector detects interference at between an optical fiber arranged close to said cantilever and said cantilever.

24. A near-field optical apparatus using a near-field optical probe as claimed in claim 1, the near-field optical apparatus having

an introducing/detecting optical system for introducing light to said microscopic aperture or detecting light from said microscopic aperture,

detector detecting a distance between said microscopic aperture and said sample, and

a fine movement mechanism for finely moving said sample or said near-field optical probe,

wherein said detecting means is displacement detecting means of the cantilever provided on said near-field optical probe.

25. A near-field optical apparatus using a near-field optical probe as claimed in claim 1, the near-field optical apparatus having

an introducing/detecting optical system for introducing light to said microscopic aperture or detecting light from said microscopic aperture,

detector detecting a distance between said microscopic aperture and said sample, and

a fine movement mechanism for finely moving said sample or said near-field optical probe,

wherein introducing/detecting optical system has an optical fiber provided at a tip with a lens function.

26. A method for manufacturing a near-field optical probe, comprising:

a process of providing a transparent member on a substrate;

a process of removing part of said transparent member by etching and forming a tip;

a process of forming a mask for a lever on said transparent member in a manner covering said tip and conducting etching to form a lever;

a process of etching said substrate from a surface opposite to a surface forming said lever to form a base; and

a process of forming a shade film on said lever excepting an end of said tip.

27. A method for manufacturing a near-field optical probe according to claim 26, wherein, in the process of forming said tip, a convex portion separate from said tip is formed simultaneous with said tip.

28. A method for manufacturing a near-field optical probe according to claim 26, wherein, in the process of forming said lever, a slant portion spreading from the tip side to said substrate side is formed in at least one of a tip or a side surface of said lever by isotropic etching.

29. A method for manufacturing a near-field optical probe according to claim 26, comprising, a process of forming a step on a substrate, prior to the process of providing a transparent member on said substrate, wherein, in the

process of forming said tip, said transparent member in part is removed by etching thereby forming a tip in the vicinity of said step.

30. A method for manufacturing a near-field optical probe according to claim 26, comprising, prior to the process of providing a transparent member on said substrate,

a process of forming a step on said substrate, and

a process of burying a material for a weight portion in said step.

31. A method for manufacturing a near-field optical probe according to claim 30, wherein the process of burying a material for a weight portion in said step comprises

a process of providing a material for a weight portion on said substrate in a manner at least filling said step, and

a process of removing the material for a weight portion for making planar such that the material for a weight portion provided in said step and a surface of said substrate form one plane.

32. A method for manufacturing a near-field optical probe according to claim 31, wherein the process of making planar is conducted by polishing.